This first article in our Article Series talks about the implications of using EQ before and after compression, something that can be hard to get your head around!

Tips & Tricks: EQ Before Compressor or Compressor Before EQ? Chuck Zwicky, April 2011

Chuck Zwicky is illustrating the very small differences...

Two of the most basic signal processors in an engineer's toolbox are Compression and EQ. In one sense these tools are cousins from different dimensions; EQ affects the level balances across the frequency spectrum and Compression affects the level balances across time.

We have so many choices available when selecting an individual EQ or compressor, but patch them together and the possibilities grow exponentially.

"Placing an EQ before a compressor can have the effect of exaggerating the applied EQ."

**EQ Before Compressor**

When combining an EQ and a compressor the order in which they are placed in the signal chain makes a big difference in the overall effect. These differences are due to both technical and psychoacoustic factors. Placing an EQ before a compressor can have the effect of exaggerating the applied EQ, due to a phenomenon similar to the psychoacoustic effect known as "frequency masking".
This phenomenon explains why many people think that compressors sound "dull".

**Frequency Masking**

Frequency masking is a phenomenon by which louder sounds (or louder frequency ranges within a sound) tend to draw our attention away from the less audible sounds (or frequencies) nearby. Any frequency boosted by the EQ will cause the compressor to lower the overall level whenever the signal source contains frequencies in the boosted range, and this sudden level shift can make the track "sound EQ'ed" without actually producing the frequency specific level changes intended by the EQ. This phenomenon explains why many people think that compressors sound "dull".

**EQ After Compressor**

Placing an EQ after a compressor you can often attain more audible results with less EQ, (and therefore fewer EQ artifacts), producing results that often do not "sound EQ'ed". Most mastering engineers EQ post compression in order to enact the most change with the least EQ.

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To understand this technically, think of a compressor and EQ as one integrated unit. Placing the EQ before the compression in this view is like having a compressor with a frequency dependent threshold. An EQ boost (for example) will send more signal at that frequency to the compressor, which in turn will react to this increase in level and try to control the output level by compressing more, often thwarting the intention of the knob-turner.

**Psychoacoustics**

From the perspective of Psychoacoustics, the human nervous system is designed to detect changes in our surroundings as a survival skill: A loud sound in a quiet environment, a sudden silence in a noisy environment, a breeze on a still day, etc... These changes in our environment command our immediate attention. In the example above, the compressor will react more to the boosted frequency and we perceive the overall change in level as a sort of "focusing" on the boosted frequency.

**In Practice**

Here is an example you can try at home:

1. Apply an EQ boost of 50 or 60hz across an entire drum track to boost the level of the bass drum a bit.
2. Feed the output of the EQ into a compressor set on a moderate ratio of 4:1, threshold of around -10dB, and with a fast attack and release.

The effect that this boost has on the compressor that follows the EQ is that the compressor will reduce the level of the entire drum track every time the bass drum hits.
The human nervous system, as described above, detects this sudden disappearance of the surrounding drum kit at every bass drum strike and the net result is that the bass drum is now more obvious, but possibly not in the way that you intended. However, if used carefully this technique can be a way to give the illusion of "power" emanating from the drums without actually requiring more level in the mix.

3. Now try swapping the order of the EQ and the compressor so that the compressor is placed before the EQ and listen to the low end.

On the Softube Tube-Tech Classic Channel this is simply a matter of toggling the "EQ before Compressor" switch.

Placing an EQ after the compression in the drum kit example above will result in an actual low frequency level increase since there is nothing to hold back the level added by the EQ.

**De-Essing**

Similar result happen when using a high frequency EQ to feed a compressor's sidechain detector input as a means of "de-essing" a vocal recording. Since the compressor will react to the additional level presented to the detector by the high frequency EQ it will compress harder in the presence of high frequency signals such as sibilants and reduce the level of the entire vocal, and again this draws our attention to the change in level and make the sibilance more audible, due to "frequency masking", though the level of the sibilance may be technically lower.

"EQ before compressor should be regarded as a completely different beast than a compressor before EQ, and the advantages and disadvantages of each are entirely dependent on the effect you seek."

**Pumping**

The opposite case is also true, sometimes using an EQ to reduce the level at some problematic frequency, such as you may encounter on a vocal recorded in a small room or from a microphone positioned too close to an acoustic instrument. This EQ cut can reduce the amount of audible compression since the compressor is not overreacting to some unwanted frequency and ducking the overall level, including all of the desirable parts of the sound along with it (also known as "pumping").

In conclusion, the combination of an EQ before Compressor should be regarded as a completely different beast than a Compressor before EQ, and the advantages and disadvantages of each are entirely dependent on the effect you seek.
Chuck Zwicky is a Manhattan-based producer and mix engineer that has been working with a number of artists and albums, including Prince, Soul Asylum, Dead Prez, and Jeff Beck.